

1 **EXTENSION STRUCTURE FOR TOOL**

2 **CROSS-REFERENCES TO RELATED APPLICATIONS**

3 The present invention is a continuation-in-part application of the
4 co-pending U.S. serial No. 10/026,787, filed on December 27, 2001.

5 **BACKGROUND OF THE INVENTION**

6 **1. Field of the Invention**

7 The present invention relates to an extension structure for a tool such
8 as a wrench or the like, and more particularly to an extension structure which
9 can be assembled easily and quickly and has a rigid construction.

10 **2. Description of the Related Art**

11 The closest prior art reference of which the applicant is aware is
12 disclosed in the Taiwanese Patent Publication No. 88221334, entitled by
13 “Main body of Wrench Extension”, which disclosed a wrench extension
14 including a main body, a push ring, and relative push and locking mechanisms.
15 However, the structure of the wrench extension is complicated, and cannot be
16 assembled easily, thereby causing inconvenience in assembly, and thereby
17 increasing cost of fabrication.

18 Another prior art references are disclosed in the U.S. Patent No.
19 6,199,457-B1, the U.S. Patent No. 6,267,032-B1, and the U.S. Patent No.
20 6,523,441-B2.

21 **SUMMARY OF THE INVENTION**

1 The primary objective of the present invention is to provide an
2 extension structure which can be assembled easily and quickly, and has a rigid
3 construction without detachment.

4 In accordance with the present invention, there is provided an
5 extension structure, comprising:

6 a main body;

7 a drive rod movably mounted in the main body;

8 an elastic member mounted in the main body and urged between the
9 main body and the drive rod; and

10 a rotation control member rotatably mounted on the main body and
11 rested on the drive rod, so that the drive rod is moved in the main body by
12 rotation of the rotation control member.

13 Further benefits and advantages of the present invention will become
14 apparent after a careful reading of the detailed description with appropriate
15 reference to the accompanying drawings.

16 **BRIEF DESCRIPTION OF THE DRAWINGS**

17 Fig. 1 is an exploded perspective view of an extension structure for a
18 tool in accordance with the preferred embodiment of the present invention;

19 Fig. 2 is a partially cut-away top plan cross-sectional assembly view
20 of the extension structure as shown in Fig. 1;

21 Fig. 3 is a front plan cross-sectional assembly view of the extension
22 structure as shown in Fig. 1;

1 Fig. 4 is a schematic operational view of the extension structure as
2 shown in Fig. 2;

3 Fig. 5 is a schematic operational view of the extension structure as
4 shown in Fig. 3; and

5 Fig. 6 is a partially perspective assembly view of the extension
6 structure in accordance with the preferred embodiment of the present
7 invention.

8 **DETAILED DESCRIPTION OF THE INVENTION**

9 Referring to the drawings and initially to Fig. 1, an extension
10 structure for a tool, such as a wrench or the like, in accordance with the
11 preferred embodiment of the present invention comprises a main body 10, a
12 drive rod 20 movably mounted in the main body 10, an elastic member 30
13 mounted in the main body 10 and urged between the main body 10 and the
14 drive rod 20, and a rotation control member 4 rotatably mounted on the main
15 body 10 and rested on the drive rod 20, so that the drive rod 20 is moved in the
16 main body 10 by rotation of the rotation control member 4.

17 The main body 10 has an elongated cylindrical shape and has an
18 inside formed with an elongated receiving chamber 14 extended in an axial
19 direction of the main body 10. The main body 10 has a first end formed with a
20 rectangular locking end 11 and a second end formed with a mounting portion
21 12. The locking end 11 of the main body 10 has a peripheral wall formed with
22 a ball receiving hole 110 communicating with the receiving chamber 14, and a

1 locking ball 13 is movably mounted in the ball receiving hole 110. The main
2 body 10 has a mediate portion having a peripheral wall formed with a circular
3 shaft hole 15 communicated with the receiving chamber 14. The shaft hole 15
4 of the main body 10 is extended into the receiving chamber 14 and has a side
5 formed with a recessed closed wall 150 (see Fig. 3).

6 The drive rod 20 is movably mounted in the receiving chamber 14 of
7 the main body 10. The drive rod 20 has a first end formed with an arcuate push
8 recess 21 that is movable to align with the ball receiving hole 110 of the main
9 body 10 for receiving the locking ball 13. The drive rod 20 has a second end
10 formed with an operation slot 22 aligning with the shaft hole 15 of the main
11 body 10.

12 The rotation control member 4 includes a circular rotation body 40
13 rotatably mounted in the shaft hole 15 of the main body 10, a knob 41 mounted
14 on a first side of the rotation body 40 and protruded outward from the main
15 body 10, a circular drive section 42 mounted on a second side of the rotation
16 body 40 and received in the operation slot 22 of the drive rod 20, and a circular
17 enlarged head 420 mounted on a distal end of the drive section 42 and
18 protruded outward from and rested on a peripheral wall of the drive rod 20.
19 Preferably, the enlarged head 420 of the rotation control member 4 is rotatably
20 mounted in the closed wall 150 of the shaft hole 15 of the main body 10 as
21 shown in Fig. 3. Preferably, the enlarged head 420 of the rotation control
22 member 4 has a diameter greater than that of the drive section 42.

1 The operation slot 22 of the drive rod 20 has the shape of a keyhole,
2 and has a first end formed with a passage portion 220 having a diameter greater
3 than that of the enlarged head 420 of the rotation control member 4 and a
4 second formed with a positioning portion 221 having a width smaller than the
5 diameter of the passage portion 220 and equal to the diameter of the drive
6 section 42 of the rotation control member 4.

7 In addition, the rotation body 40 of the rotation control member 4
8 formed with a recessed oblique guide face 401, and the operation slot 22 of the
9 drive rod 20 has a distal end formed with an oblique guide edge 23 rested on
10 the guide face 401 of the rotation control member 4. Thus, the rotation body 40
11 of the rotation control member 4 is rotatable between a first position where the
12 guide face 401 of the rotation body 40 is aligned with and rested on the guide
13 edge 23 of the drive rod 20 and a second position where the peripheral wall 404
14 of the rotation body 40 is aligned with and rested on the guide edge 23 of the
15 drive rod 20 to move the drive rod 20. In such a manner, the drive rod 20 is
16 moved by rotation of the rotation body 40 of the rotation control member 4.

17 The receiving chamber 14 of the main body 10 has a distal end
18 formed with a closed wall. The elastic member 30 is mounted in the receiving
19 chamber 14 of the main body 10 and is biased between the closed wall of the
20 receiving chamber 14 and the second end of the drive rod 20.

21 In assembly, referring to Figs. 1-6, the drive rod 20 is pressed to
22 retract into the receiving chamber 14 of the main body 10 to compress the

1 elastic member 30 until the operation slot 22 of the drive rod 20 aligns with the
2 shaft hole 15 and the passage portion 220 of the operation slot 22 aligns with
3 the enlarged head 420 of the rotation control member 4. Then, the enlarged
4 head 420 of the rotation control member 4 is passed through the shaft hole 15
5 of the main body 10 and the passage portion 220 of the operation slot 22 and
6 inserted into the recessed closed wall 150 of the shaft hole 15 as shown in Fig.
7 3. At the same time, the drive section 42 of the rotation control member 4 is
8 extended through the passage portion 220 of the operation slot 22, and the
9 rotation body 40 of the rotation control member 4 is mounted in the shaft hole
10 15 of the main body 10. Then, the rotation body 40 of the rotation control
11 member 4 is rotated in the shaft hole 15 of the main body 10 until the guide
12 face 401 of the rotation body 40 is aligned with the guide edge 23 of the drive
13 rod 20. At this time, the drive rod 20 is pushed by the elastic member 30 to
14 move outward relative to the main body 10 and the rotation control member 4
15 until the guide face 401 of the rotation body 40 is rested on the guide edge 23
16 of the drive rod 20, so that the drive section 42 of the rotation control member
17 4 is inserted into the positioning portion 221 of the operation slot 22 as shown
18 in Fig. 2 and the enlarged head 420 of the rotation control member 4 is rested
19 on the peripheral wall of the drive rod 20. Thus, the rotation control member 4
20 and the drive rod 20 are combined with each other integrally and cannot be
21 separated from each other. In addition, the drive section 42 of the rotation
22 control member 4 is slidable in the positioning portion 221 of the operation slot

1 22 without detachment by restriction of the enlarged head 420 of the rotation
2 control member 4. At the same time, the locking ball 13 is pushed by the push
3 recess 21 of the drive rod 20 to protrude outward from the ball receiving hole
4 110 of the main body 10 as shown in Fig. 3.

5 Accordingly, the extension structure for a tool such in accordance
6 with the present invention is assembled easily and quickly, and has a rigid
7 construction without detachment.

8 In operation, referring to Figs. 1-6, the guide edge 23 of the drive rod
9 20 is initially rested on the guide face 401 of the rotation body 40, and the
10 locking ball 13 is pushed by the push recess 21 of the drive rod 20 to protrude
11 outward from the ball receiving hole 110 of the main body 10 as shown in Fig.
12 3. Then, the rotation body 40 of the rotation control member 4 is rotated by the
13 knob 41 to separate the guide edge 23 of the drive rod 20 from the guide face
14 401 of the rotation body 40, so that the peripheral wall 404 of the rotation body
15 40 is urged on the guide edge 23 of the drive rod 20 to move the drive rod 20
16 toward the main body 10 and the rotation control member 4 to compress the
17 elastic member 30. In such a manner, the push recess 21 of the drive rod 20 is
18 moved to align with the ball receiving hole 110 of the main body 10, so that the
19 locking ball 13 is retracted into the push recess 21 of the drive rod 20 and is
20 retracted inward from the ball receiving hole 110 of the main body 10 as shown
21 in Fig. 5. At this time, the drive section 42 of the rotation control member 4
22 slides in the positioning portion 221 of the operation slot 22 as shown in Fig. 4.

1 Although the invention has been explained in relation to its preferred
2 embodiment as mentioned above, it is to be understood that many other
3 possible modifications and variations can be made without departing from the
4 scope of the present invention. It is, therefore, contemplated that the appended
5 claim or claims will cover such modifications and variations that fall within the
6 true scope of the invention.